

Claims

1. A fastener for releasably securing a first element to a second element in a spaced- apart relationship, the fastener comprising:
 - a locking pin moveable between a locked position in which said first element is secured in spaced relationship to said second element and a release position in which said first element is released from said spaced relationship with said second element, the locking pin having an engageable head;
 - means for engaging the head of said locking pin with said second element;
 - bias means influencing said second element away from said first element; and
 - an actuator comprising or including shape memory alloy adapted to elongate upon application of appropriate energy;wherein said actuator is adapted, when elongated, to cause said locking pin to move to the release position.
2. The fastener of claim 1, which also comprising an integrated processor, a switch and one or more sensors.
3. The fastener of claim 2, in which said sensor is adapted to sense whether said locking pin is in the locked position or the release position.
4. The fastener of claim 3, in which said sensor comprises micro switches adapted to be activated by said locking pin or an extension of said locking pin.
5. The fastener of claim 1, wherein said locking pin is made of polymeric material.
6. The fastener of claim 1, wherein said locking pin has an internal cavity adapted to receive a guide pin.
7. The fastener of claim 1, wherein the means for engaging the head of said locking pin with said second element comprises a clip.
8. The fastener of claim 7, wherein said clip is annular.

9. The fastener of claim 7, wherein said clip is in two or more parts.
10. The fastener of claim 7, wherein said clip is made of elastic material.
11. The fastener of claim 1, wherein said locking pin has a shaft of narrower cross-section than the head of said locking pin.
- 5 12. The fastener of claim 11, wherein said locking pin is adapted to move to the release position after the engagement means has disengaged the head of said locking pin and has moved towards the shaft.
13. The fastener of claim 1 when assembled onto said first element.
14. The fastener of claim 1, wherein the bias means influencing said second element away
10 from said first element is a coiled spring.
15. The fastener of claim 1, wherein said actuator is a single coiled spring made of shape memory alloy.
16. The fastener of claim 15, wherein said actuator is adapted to elongate by energy provided from an energy source.
- 15 17. The fastener of claim 16, wherein there is a cable connection between said energy source and said actuator.
18. The fastener of claim 16, wherein said energy is in the form of infra red light or ultrasound.
19. The fastener of claim 1, wherein said locking pin is adapted to default to the locked
20 position.
20. The fastener as claimed in claim 1, which comprises a second actuator.
21. The fastener of claim 20, wherein said second actuator comprises shape memory alloy adapted to elongate upon application of appropriate energy to cause the locking pin to move to the locked position.

22. The fastener of claim 1, which comprises a detent adapted to hold said locking pin in the locked and/or release position.
23. The fastener of claim 22, wherein said detent is adapted to clip into a groove in the locking pin when the locking pin is in the release position, said engagement between said detent and the groove being adapted to prevent said locking pin moving towards the locked position without positive actuation.
24. The fastener of claim 1, wherein said locking pin is adapted to move from the locked position to the release position irreversibly.
25. The fastener of claim 1, wherein said actuator is adapted to cause said locking pin to move to the locked position when no longer elongated.
26. The fastener of claim 1, which also comprises means to communicate with at least one slave fastener.
27. The fastener of claim 26, wherein said communication means is adapted to communicate with the slave fastener when the locking pin has been caused to move to the release position.
28. The fastener of claim 1, wherein said fastener has an address.
29. The fastener of claim 28, wherein said address is encrypted.
30. The fastener of claim 1, wherein said fastener includes means for enabling the fastener to recognize an authorised operator.
31. The fastener of claim 1, wherein the locked pin is adapted to be moved to the release position manually.
32. A fastener assembly for releasably securing an element, the element comprising a post or pin having a groove, the assembly comprising a bar adapted to engage the groove to secure the element, the assembly also comprising a connecting means having first and second ends, the first end being attached to an end of the bar and the second end being attached to an anchor point, the connecting means comprising of shape memory material which, upon application of suitable energy, is adapted to change shape and

draw the bar out of engagement with the groove, thus releasing the element, wherein the assembly also comprises a brace for the connecting means positioned between the first and second ends of the connecting means.

33. The fastener assembly of claim 32, wherein said element has more than one post or pin,
5 each having a groove.
34. The fastener assembly of claim 33, wherein said bar is adapted to engage the groove in more than one post or pin.
35. The fastener assembly of claim 34, wherein said bar engages the groove in each of two posts or pins.
- 10 36. The fastener assembly claim 32, wherein said connecting means is a shape memory wire.
37. The fastener assembly of claim 36, wherein said shape memory wire is a titanium-nickel wire.
38. The fastener assembly of claim 36, wherein said anchor point is the other end of the bar
15 and said connecting means is adapted to change shape by shrinking to draw the bar out of engagement with the groove.
39. The fastener assembly of claim 32, wherein said bar is biased into engagement with the groove.
40. A fastener for releasably securing an airbag between a base and a cover, the fastener
20 comprising:
- a locking pin moveable between a locked position in which the base is secured in spaced relationship to the cover and a release position in which the base is released from the spaced relationship with the cover, the locking pin having an engageable head;
- 25 means for engaging the head of the locking pin with the cover;
- bias means urging the cover away from the base; and

an actuator comprising shape memory alloy adapted to elongate upon application of appropriate energy,

wherein the actuator is adapted, when elongated, to cause the locking pin to move to the release position.

- 5 41. The fastener of claim 40, which also comprises an integrated processor, a switch and one or more sensors.
42. The fastener of claim 41, in which said sensor is adapted to sense whether the locking pin is in the locked position or the release position.
43. The fastener of claim 42, in which said sensor includes micro switches adapted to be
10 activated by the locking pin or an extension of the locking pin.
44. The fastener of claim 40 which also comprises a sensor adapted to sense and report the presence or absence of the airbag.
45. The fastener of claim 40, wherein said locking pin is made of polymeric material.
46. The fastener of claim 40, wherein said locking pin has an internal cavity adapted to
15 receive a guide pin.
47. The fastener of claim 40, wherein said means for engaging the head of said locking pin with the cover comprises a clip.
48. The fastener of claim 47, wherein said clip is annular.
49. The fastener of claim 47, wherein said clip is in two or more parts.
- 20 50. The fastener of claim 47, wherein said clip is made of elastic material.
51. The fastener of claim 40, wherein said locking pin has a shaft of narrower cross-section than that of the head of the locking pin.
52. The fastener of claim 51, wherein said locking pin is adapted to move to the release position after the engagement means has disengaged the head of the locking pin and has
25 moved towards the shaft.

53. The fastener of claim 40 when assembled onto the base.
54. The fastener of claim 40, wherein said bias means influences the cover away from the base is a coiled spring.
55. The fastener of claim 40, wherein said actuator is a single coiled spring made of shape memory alloy.
56. The fastener of claim 55, wherein said actuator is adapted to elongate by energy provided from an energy source.
57. The fastener of claim 56, wherein there is a cable connection between the energy source and the actuator.
58. The fastener of claim 56, wherein said energy is in the form of infra red light or ultrasound.
59. The fastener of claim 56, wherein said energy source is a vehicle battery.
60. The fastener of claim 40, wherein said locking pin is adapted to default to the locked position.
61. The fastener as claimed in claim 40, which comprises a second actuator.
62. The fastener of claim 61, wherein said second actuator comprises shape memory alloy adapted to elongate upon application of appropriate energy to cause the locking pin to move to the locked position.
63. The fastener of claim 40, which comprises a detent adapted to hold the locking pin in the locked and/or release position.
64. The fastener of claim 63, wherein said detent is adapted to clip into a groove in the locking pin when the locking pin is in the release position, the engagement between the detent and the groove being adapted to prevent the locking pin moving towards the locked position without positive actuation.
65. The fastener of claim 40, wherein said locking pin is adapted to move from the locked position to the release position irreversibly.

66. The fastener of claim 40, wherein said actuator is adapted to cause said locking pin to move to the locked position when no longer elongated.
67. The fastener of claim 40, which also comprises means to communicate with at least one slave fastener.
- 5 68. The fastener of claim 67, wherein said communication means is adapted to communicate with said slave fastener when the locking pin has been caused to move to the release position.
69. The fastener of claim 40, wherein said fastener has an address.
70. The fastener of claim 69, wherein said address is encrypted.
- 10 71. The fastener of claim 40, wherein said fastener includes means for enabling said fastener to recognise an authorised operator.
72. The fastener of claim 40, wherein said locked pin is adapted to be moved to the release position manually.
73. A method of installing an airbag between a base and a cover, the method comprising
15 the steps of:

connecting at least one fastener as claimed in any one of claims 40 to 72 to the base;

connecting the airbag to the base; and

causing the locking pin to move to the locked position to secure the airbag between the base and the cover.
- 20 74. The method of claim 73 in which steps (a) and (b) are reversed.
75. The method of claim 73, which comprises the further step of connecting each fastener to wiring for the airbag.
76. The method of claim 75, wherein said airbag wiring is connected to an engine control unit.